ORIGINAL ARTICLE

Sleep Disorders in Children Beginning School: Their Causes and Effects

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SUMMARY

Background: Sleep disorders are a common problem among children beginning school and may be associated both with impaired school performance and with behavioral difficulties. Because these disorders manifest themselves highly variably among children of any given age, and even in an individual affected child, they need an appropriate diagnostic evaluation so that the many environmental and background factors that may be relevant to the further course of the problem can be assessed.

Methods: Extensive data were obtained on approximately 1400 children who were tested before beginning school in 2005 by means of a special sleep questionnaire and another screening instrument that is used to assess behavioral strengths and difficulties (the SDQ, Strengths and Difficulties Questionnaire).

Results: Five percent of the children were found to have difficulty falling asleep, difficulty staying asleep, or nocturnal awakening. Less frequent problems included parasomnias such as pavor nocturnus (0.5%), sleepwalking (0.1%), and frequent nightmares (1.7%).

Conclusion: Sleep disorders increase the risk of daytime fatigue and of psychological problems in general, including both hyperactivity and excessive emotional stress. These results imply that sleep problems and emotional disturbances are intimately connected and underscore the importance of diagnosing sleep problems in young children.

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Key words: sleep disorder, schoolchildren, insomnia, child health, emotional stress

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Sleep disorders affect not only the children concerned, but also their parents and siblings. There are conflicts every evening, and the children have difficulty getting up in the morning. They suffer more than others from daytime tiredness and are irritable and restless. Sleep disorders are common in children of elementary school age. Depending on the investigation technique—questionnaires, interviews, inclusion of the parents and/or the children—and the sampling, estimates of prevalence vary between 25% and 43% (1, 2).

Stein and coauthors (3) find it particularly significant that children with sleep disturbances are often at a higher risk of further psychic, social, and medical problems. For this reason, they urge that increased attention be paid to possible sleep disorders during routine medical examinations, e.g., visits to the pediatrician or family physician. Epidemiological and school-based studies demonstrate that excessive daytime fatigue is responsible for significant impairments in school performance and behavioral problems in about 10% of schoolchildren (4, 5). Although these links are well known, to date no effective diagnosis and treatment strategies have been developed (6).

The authors investigated 2- to 14-year-old children treated at a pediatric hospital to establish the incidence of previously undiagnosed sleep disorders. Of the 830 children studied, 86 had sleep problems; these had been recorded in only two cases, and even there they were not the reason for treatment. One possible reason for this is that parents do not explicitly raise the issue of their children's sleep problems in visits to doctors or psychological counselors. Rather, they just mention the sleep disorders in the framework of a nonspecific account of their children's behavioral disturbances or developmental deficits. Moreover, confident labeling of a child's sleep patterns as pathological is hampered by the considerable age-related variability in sleep patterns.

The duration and quality of sleep display considerable intra- and interindividual fluctuations and are also subject to cultural influence. These factors impede diagnostic classification. Representative epidemiological investigations in the German cities Heidelberg and Cologne, however, are in close agreement with regard to the prevalence of sleep disorders—7.2% and 7.7% respectively, with no difference between boys and girls. The parents most frequently report problems in falling asleep and staying asleep (insomnia) and nightmares (7). Although many studies confirm high rates of comorbidity between

TABLE 1

Prevalence of sleep disorders (n = 1388)

Insomnias	Sometimes	Often
Difficulty falling asleep	16.8% (233)	5.1% (70)
Difficulty staying asleep	12.8% (178)	5.2% (72)
Waking at night	39.6% (550)	5.6% (78)
Parasomnias	**Sometimes**	**Often**
Night terrors	7.6% (105)	0.5% (7)
Sleepwalking	3.2% (44)	0.1% (1)
Nightmares	22.1% (306)	1.7% (24)
Enuresis	11.0% (153)	5.3% (74)
Bruxism	24.5% (340)	7.1% (99)
Organic sleep disorders/ symptoms	**Sometimes**	**Often**
Snoring	28.0% (388)	4.6% (64)
Apnea	1.9% (27)	0.9% (12)
Restless sleep	22.4% (311)	3.8% (52)
Perspiration	22.1% (307)	3.9% (54)
Restless legs syndrome	2.4% (33)	0.5% (7)
Daytime symptoms	**Sometimes**	**Often**
Midday nap	6.4% (89)	1.0% (14)
Daytime fatigue	14.4% (199)	0.9% (12)
Suddenly falling asleep	2.8% (39)	0.1% (2)
Restricted physical capacity	5.3% (73)	1.4% (20)

psychiatric illness and sleep disorders in childhood and adolescence, it remains uncertain whether sleep problems increase vulnerability to psychiatric disturbances. Furthermore, there is still too little information (8–11) on the relevance of environmental and background factors such as bothersome light and noise, somatic diseases, unfavorable living conditions, and family problems.

In a large sample of children beginning school, the authors investigated how frequently sleep disorders can be expected, what exacerbating factors are connected with the symptoms, and whether further behavioral disturbances can be anticipated. The aim of the study was to provide parents and physicians with more information on sleep disorders.

Methods

In spring 2005 a questionnaire was sent to the parents of each new pupil at every second elementary school in Cologne. The schools to be included were selected at random. The investigation took place in the framework of the routine examination of children starting school and in cooperation with the education authorities. Overall, 4793 out of 8992 families of school beginners were contacted. For the sake of representativeness, the authors classified the schools according to district. Altogether 1496 questionnaires were returned, of which 1388, i.e., almost 29% of those sent out, could be evaluated. There were 712 boys (51.3%) and 676 girls (48.7%); their average age was 5.52 years. In total, 86.1% of the children were of German origin and 13.9% had other nationalities.

The screening questionnaire, designed by the authors, featured 33 items on ordinal scales. The questions focused principally on

- sleep behavior (problems falling asleep and staying asleep, daytime fatigue, regular bedtimes and getting up times, etc.)
- sleep environmental factors and sleep hygiene (noise, light, other people in room)
- daytime activities (e.g., time spent watching television)

There was no existing German questionnaire on sleep behavior. Therefore, a catalog of items was compiled on the basis of the relevant literature, tested on several samples, and validated by means of interviews conducted in parallel. A three-step scale was used analogous to the Child Behavior Checklist: "Sometimes" was defined as "occurs occasionally," "not more than once a week," or "within the past 6 months." "Often" meant "occurs regularly" or "more than once a week." The third option was "Never."

The second instrument employed, the Strengths and Difficulties Questionnaire (SDQ), is a screening procedure using metric scales. The 25 factorized items permit evaluation of five areas:

- Emotional symptoms
- Hyperactivity
- Conduct problems
- Peer relationship problems
- Prosocial behavior.

The authors analyzed the individual categories and the total score (12). The five scales can attain values between 5 and 10 when all items have a maximal score. The total score can range from 0 to 40.

In addition to a descriptive presentation of the data, the statistical analysis tested the relationships between sleep difficulties and parameters, by means of correlations (rank correlation according to Spearman) and relative risk. For evaluation of the relative risks the items were dichotomized: the categories "Sometimes" and "Partly" were combined with "Often" to form the category "Sleep disorder present." Group comparisons of children with and without sleep disorders were carried out by means of *t* tests for independent samples.

Results

Parents most frequently reported that their children had difficulty falling asleep and staying asleep. Parasomnias such as sleepwalking, nightmares, and night terrors were much less common. When assessing the reported frequency of a given sleep disorder, it is important whether the problem occurs sometimes or often. The three types of insomnia all occurred often in about 5% of cases; the corresponding figures for the parasomnias varied between 0.1% and 7.1% *(table 1)*. Daytime fatigue occurred often in 0.9% and sometimes in 14.4% of the

children. One percent of the children often had a midday nap, 6.4% sometimes. The prevalence of the stress factors infections, allergies, chronic illness, and family problems varied between 1.9% and 4.3% in children who often had sleep problems *(table 2)*. Chronic illness, infections, and allergies particularly increased the relative risk for difficulty staying asleep, namely 1.4- to 2.1-fold; the association with difficulty falling asleep was weaker *(table 3)*.

However, difficulties in falling asleep led to a 1.7-fold risk of daytime fatigue and a 1.8-fold risk of restricted physical capacity. The findings were similar for difficulties staying asleep, which were associated with a 2.1 times higher risk of suddenly falling asleep during the day. With regard to sleep hygiene, the authors found that variable bedtimes more than doubled the occurrence of both problems falling asleep and problems staying asleep. Although watching television before going to sleep had no influence on sleep behavior in this sample, children with a television set in their room woke more frequently at night. This may be linked to less strict monitoring of television consumption by the children's' parents. Bothersome light and noise had a strong influence on sleep, but smoking in the household had no effect. Infections, allergies, and above all family stress led to more problems in falling asleep and staying asleep *(table 3)*.

In all areas there were significant relationships between various types of sleep disorder and the emotional strain on the children or their behavioral disturbances; the relative risk lay between 1.5 and 2.9 *(table 4)*. The highest correlations with regard to difficulty falling asleep were between hyperactivity and the overall score in the SDQ *(table 4)*. Also investigated was the association (relative risk) between sleep problems and behavioral disturbances. *Table 5* shows that children with sleep disorders can be expected to be more prone to mental problems. A sensitive parameter for such symptoms is the overall score of the SDQ, along with the areas "Emotional symptoms" and "Hyperactivity."

TABLE 2

Prevalence of environmental and stress factors (n = 1388)

Sleep hygiene parameter	Sometimes	Often
Regular bedtime	14.5 (201)	83.2% (1154)
Regular waking time	18.8% (261)	77.0% (1067)
Other people in room	6.6% (91)	41.3% (573)
Watching TV before going to sleep	44.0% (611)	30.6% (425)
TV set in room	1.4% (20)	12.3% (171)
Light	6.9% (96)	2.3% (32)
Noise	9.6% (133)	1.3% (18)
Smoking in household	11.8% (163)	11.6% (161)
Infections	21.4% (297)	4.3% (60)
Allergies	8.2% (114)	4.2% (58)
Chronic illness	1.2% (17)	1.9% (26)
Family problems	26.2% (363)	2.4% (33)

Discussion

Although the frequencies of sleep problems in children starting school observed in this investigation broadly correspond to the results of other epidemiological studies, the findings show that it is important to distinguish among the various types and severities of sleep disorders. In an earlier survey that used comparable instruments, 10% of the children had had difficulty falling asleep and staying asleep in the previous three months (7). In a Swedish study almost 60% of those questioned said they never experienced any difficulty falling asleep and staying asleep, but 6% suffered these problems more than once a week. The stated prevalence of waking during the night varies between 1.2% and about 7%, the authors pointing out that the children affected often need a long time to get back to sleep (11). Blader and colleagues (13) report that almost 25% of children who have difficulty falling asleep stay awake for about half an hour, a good 50% for 30 to 60 minutes, and one fifth for more than an hour. The situation was no better for those with problems staying asleep: Only 16.5% could go back to sleep within 30 minutes, a good 50% needed 30 to 60 minutes, and 33% required one to three hours.

The prevalence figures for the parasomnias also largely correspond with the findings of previous field studies. Nightmares are especially frequent, but chronic parasomnias rarely persist for an extended time in children (14). Particularly close attention should be paid to parasomnias, because their regular occurrence can be a sign of mental strain and stress factors. It is also important to establish the degree of severity. In a study by Neveus et al. (15), 5% of those questioned reported that they had nightmares every night, just under 5% every week, and around 52% at least once a month. In the sleep study by Spruyt and coauthors (16) almost 4% of the children had nightmares every week, and some authors, e.g., Rabenschlag (17), report considerably higher figures: In their cohorts nearly 50% of the 6- to 12-year-olds suffered from parasomnias. These discrepancies should prompt doctors to ascertain both the type and the severity of sleep disorder as well as its negative effects. Routine recording is necessary above all in order to be able to distinguish between sleep disorders typical and those atypical for the child's developmental stage.

The severity of symptoms, the persistence of the problems, and their impact on diurnal and nocturnal behavior offer themselves as criteria and reference points for sleep disorders. Furthermore, environmental and stress factors should be ascertained, because especially poor sleep hygiene, infections and family stress are detrimental to sleep behavior. Whenever sleep disorders are reported, special attention should be paid to these potential background phenomena, insofar as they are recorded (2, 18). In this regard it is important to inform both parents and children about the factors that lie

TABLE 3

Influence of sleep hygiene and stress factors on sleep

	Difficulty falling asleep (RR; CI)	Difficulty staying asleep (RR; CI)	Waking at night (RR; CI)
No regular bedtime	2.4* (1.6–3.4)	2.1* (1.3–3.4)	1.3 (0.9–1.7)
Other people in room	1.0 (0.9–1.3)	1.0 (0.8–1.2)	0.8* (0.8–0.95)
Watching TV before going to sleep	1.1 (0.9–1.4)	1.1 (0.8–1.4)	1.1 (1.0–1.3)
TV set in room	1.1 (0.8–1.4)	0.7 (0.5–1.1)	0.8* (0.6–0.9)
Bothersome light	1.6* (1.3–2.1)	1.7* (1.2–2.3)	1.2 (1.0–1.4)
Bothersome noise	1.7* (1.4–2.2)	1.3 (1.0–1.8)	1.0 (0.9–1.3)
Smoking in household	1.2 (0.9–1.5)	1.0 (0.8–1.3)	1.1 (0.9–1.2)
Infections	1.5* (1.2–1.8)	1.9* (1.5–2.4)	1.3* (1.2–1.5)
Allergies	1.4* (1.05–1.8)	1.4* (1.03–1.9)	1.1 (1.0–1.3)
Chronic illness	1.2 (0.7–2.0)	2.1* (1.4–3.2)	1.3 (1.0–1.6)
Family problems	2.0* (1.6–2.4)	1.8* (1.4–2.2)	1.3* (1.2–1.5)

n = 1388; RR, relative risk; CI, 95% confidence interval; *chi-square test $p < 0.05$

behind sleep disorders and how they are often aggravated. Sleep education and the imparting of and adherence to the rules of sleep hygiene form an essential basis for counseling and treatment (19). The better informed parents and children are about sleep, the better they can cope with and reduce sleep problems. Such an approach often suffices to improve the child's sleep and provide the family with the ability to solve the problem themselves.

The influencing variables found in the present study strongly suggest that physicians should enquire about sleep environmental factors and family interaction problems not only in cases of difficulty falling asleep and staying asleep, but also in parasomnias. If there is any suspicion of further behavioral problems, these should be raised for discussion. Screening instruments such as the SDQ yield information about social behavior, emotional strain, hyperactivity, and behavioral disturbances (7, 12). For both problems falling asleep and problems staying asleep, the risk of abnormal values in the SDQ was raised two- to threefold. These effects were present for the overall SDQ score and for the subscales "Emotional symptoms," "Hyperactivity," "Conduct problems," and "Peer relationship problems." Thus, sleep disorders are a frequent symptom in children with attention deficit/hyperactivity disorder, and emotional disturbances are also associated with a higher rate of sleep changes. If several risks come together there is the danger of self-perpetuation of the sleep disorders, because the child's negative habits with regard to falling asleep and staying asleep often maintain the maladjustment. For example, analyses of the longitudinal data of the Cologne Child Sleep Study (14) show that 20% of children in fourth grade have difficulties falling asleep and staying asleep and that these problems persist over a period of several years. Apart from conflicts associated with the sleep situation, sleep-related anxieties are also important and should be documented because they require further-reaching therapeutic interventions. The present findings speak for a complex interaction among psychosocial stress factors, behavioral disturbances, and sleep disorders. These relationships had previously been suspected but not demonstrated empirically, so that both diagnostic and educational approaches can be derived from this study. It must be pointed out, however, that the authors can make no statement with regard to causal direction. On the one hand, it can be assumed that chronic sleep disorders have a detrimental impact on emotional state, but behavioral problems can also lead secondarily to difficulties falling asleep and staying asleep. Since sleep disorders often indicate other risks but are seldom the primary reason why parents take their children to the doctor, the examining physician should specifically enquire about sleep problems and their causes should be identified. Attention should be paid to accompanying psychiatric symptoms and to psychosocial risks.

TABLE 4

Relationship between sleep problems and behavioral disturbances in the SDQ

Type of insomnia	Overall (Spearman R; CI)	Emotional symptoms (Spearman R; CI)	Hyperactivity (Spearman R; CI)	Conduct problems (Spearman R; CI)	Peer relationship problems (Spearman R; CI)	Prosocial behavior (Spearman R; CI)
Difficulty falling asleep	2.9* (2.2–3.9)	2.1* (1.6–2.8)	2.8* (2.1–3.9)	1.7* (1.4–2.0)	1.3 (1.0–1.7)	1.5* (1.04–2.1)
Difficulty staying asleep	2.4* (1.7–3.2)	2.2* (1.6–3.0)	1.9* (1.4–2.7)	1.6* (1.3–1.9)	1.2 (0.9–1.6)	1.0 (0.7–1.6)
Waking at night	1.5* (1.1–2.1)	1.5* (1.1–2.0)	1.2 (0.9–1.7)	1.3* (1.1–1.6)	1.0 (0.8–1.2)	1.3 (0.9–1.8)

n = 1388; Spearman R, Spearman rank correlation coefficient; CI, 95% confidence interval; SDQ, Strengths and Difficulties Questionnaire; *chi-square test $p < 0.01$

TABLE 5

Risk of behavioral disturbances in the presence of sleep disorders

Type of parasomnia	Overall (RR; CI)	Emotional symptoms (RR; CI)	Hyperactivity (RR; CI)	Conduct problems (RR; CI)	Peer relationship problems (RR; CI)	Prosocial behavior (RR; CI)
Night terrors	3.2* (2.3–4.5)	2.7* (1.9–3.8)	2.2* (1.5–3.4)	1.7* (1.4–2.2)	2.3* (1.7–3.1)	1.1 (0.6–1.9)
Sleepwalking	3.7* (2.4–5.6)	2.7* (1.7–4.4)	3.8* (2.4–5.9)	2.0* (1.5–2.8)	2.4* (1.6–3.7)	1.5 (0.7–3.1)
Nightmares	1.6* (1.1–2.1)	2.5* (1.9–3.4)	1.3 (0.9–1.8)	1.5* (1.2–1.8)	1.2 (0.9–1.6)	1.0 (0.7–1.5)
Enuresis	1.7* (1.2–2.5)	1.4 (1.0–1.9)	1.5* (1.1–2.2)	1.5* (1.2–1.8)	1.2 (0.8–1.6)	1.1 (0.7–1.6)
Bruxism	1.5* (1.1–2.0)	1.7* (1.3–2.3)	1.2 (0.9–1.7)	1.2 (1.0–1.5)	1.2 (0.9–1.5)	1.4 (1.0–2.0)

n = 1388; RR, relative risk; CI, 95% confidence interval; *chi-square test $p < 0.05$

The principal limitation of the study is the relatively low response rate. However, special attention was paid to inclusion of schools from all parts of Cologne. In this regard, the response showed no systematic distortions. Only 13.9% of the questionnaires evaluated came from parents of non-German children, indicating underrepresentation of this group. In order not to endanger the parents' willingness to cooperate, social variables were not included in the survey. Since school pupils from all districts of the city were included, the risk that may arise from the distortion of social data is minimized.

Conclusion

A high proportion of children beginning school suffer from sleep problems. In many cases this is a temporary, developmentally related phenomenon, but in 5% to 10% of the children affected the disorder is more serious and may be connected with various stress factors and further behavioral disturbances. Sleep disorders may constitute an initial manifestation that prompts further diagnostic and therapeutic measures.

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Conflict of interest statement
The authors declare that no conflict of interest exists according to the guidelines of the International Committee of Medical Journal Editors.

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Key messages

- Children who have difficulty falling asleep are at greater risk of daytime fatigue and more frequently report restricted physical capacity.
- Bothersome light and noise are particularly detrimental to falling asleep, while family stress leads to increased problems with falling asleep and staying asleep.
- Difficulty falling asleep and difficulty staying asleep are both often accompanied by emotional problems and hyperactivity disorders.
- Because sleep disorders are often not the primary reason for visiting the doctor, they should be routinely documented in order not to overlook possible comorbidities and psychosocial risk and stress factors.

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